

DEPARTMENT OF DEFENSE BLOGGERS ROUNDTABLE WITH BRUCE WEST, CHIEF SCIENTIST, U.S. ARMY RESEARCH OFFICE, MATHEMATICAL AND INFORMATION SCIENCE SUBJECT: GLOBAL WARMING AND SOLAR CYCLES MODERATOR: LINDY KYZER, ARMY PUBLIC AFFAIRS ALSO PRESENT: CHARLES "JACK" HOLT, CHIEF, NEW MEDIA OPERATIONS, OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE PUBLIC AFFAIRS TIME: 11:00 A.M. EDT DATE: THURSDAY, JUNE 5, 2008

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MS. KYZER: I'm Lindy with Army Public Affairs. I'm glad to be having this call. I have to offer a disclaimer first just because of the debate that has already gone on. The Army does not have an official policy stance on global warming. As you can imagine, we do research on a number of topics and we have Army researchers and scientists and mathematicians working in thousands of areas right now across the globe doing a wide variety of research.

One of the primary purposes for having these Bloggers' Roundtables specifically to highlight Army science and technology is to let the American public know that that's going on. Because usually it's kind of a hidden component of the work that the Army does, that we do have all of this research going on, again, on a variety of topic areas. This is just one of those areas.

I also need to reiterate that the Army is daily continually reducing carbon emissions. The -- a significant percentage of the vehicles we have out there are hybrid technology. Our new non-line-of-sight cannon that's a part of our future combat systems actually utilizes hybrid technology as well.

So certainly we are environmentally aware, but we also know that research needs to be conducted on a variety of areas. And when we do have sound research, we want to apply it to different areas.

And that's why Dr. Bruce West is with us. He's a chief scientist with the Mathematical and Information Science Directorate with the Army Research Office. Again, he's discussing the causes of global warming and some research that he recently conducted that indicates it may not be caused by the common indicators that we think of.

His research specifically goes into directly linking to distinctly different aspects of the sun dynamics -- the short-term statistical fluctuations and the sun's irradiance, and the longer-term solar cycles.

So again, he's with us to discuss his research. So I'm happy to introduce to you Dr. Bruce West, who will open with a few minutes of comments and then we will go to your questions.

Dr. West?

MR. WEST: Thank you, Lindy.

Let me begin by saying that I appreciate the opportunity to discuss my research on the causes of climate change in this forum, and I look forward to answering your questions.

The Army Research Office encourages its chief scientists to pursue their research interests as part of their job description. But it is not often that we have the chance to discuss our work outside a scientific setting.

I should mention that I also hold an adjunct professorship in the physics department at Duke University, where six years ago I brought my colleague and collaborator on this work, Dr. Nicola Scafetta, as a post-doctoral researcher and where he continues today as a research scientist.

What I believe is of interest to all of you is the fact that our research has suggested an alternative to the apparently universally accepted cause of global warming. Many contend that the controversy over the causes of global warming have been resolved, with the scientific community concurring that humanity has caused the increase in the Earth's average surface temperature. Well, Dr. Scafetta and I disagree with this representation of scientific opinion. That opinion is, in the end, irrelevant to the science.

Science has never been a matter of consensus building. Science proceeds by what might be characterized as controversy and disagreement, which is ultimately resolved by the interplay between experiment and theory and not by committee.

The average temperature of the Earth's surface has increased by approximately .8 degrees Centigrade over the last century, coincident with the growth of industry. The background for this temperature increase is recorded in the United Nations Intergovernment Panel on Climate Change 2007 report.

After detailed discussion of the phenomenology, this report concludes that the Earth's temperature increase is due solely to anthropogenic greenhouse gas concentrations in the atmosphere. This conclusion is presented as the majority opinion of scientists and is based on an analyses using a mix of large-scale computational global circulation models and energy balance models that incorporate into the calculations all identified physical and chemical mechanisms. Finally, they deduce from those models that the contribution of solar variability to global warming is negligible to a 95 percent certainty.

Our own analysis of the total solar irradiance and the modeling of the Earth's climate response to changes in that irradiance lead us to conclude that the Earth's average surface temperature is directly linked to two distinctly different aspects of the sun's dynamics, in marked contrast to the findings of the United Nations report.

One sun-climate linking involves the short-term fluctuations in the sun's irradiance, with variability on the scale of days and weeks. We determined that the statistics of the time interval between solar flares -- or sunspots, which is a different phenomenon -- can be described by a distribution invented by Pareto to describe the distribution of income levels in society in the late 19th century.

What makes this distribution interesting is its deviation from the bell-shaped curve we all learned about in college when we were graded on a scale and its dependence on large excursions such as you see in the distribution of wealth and the diagnosis of disease.

Our analysis of the temperature anomalies of the Earth's surface yields exactly the same Pareto distribution. We were able to develop a theory based on the transfer of information to predict the conditions under which the Earth's surface temperature would inherit the short-term statistical variability of the sun's dynamics.

Consequently, there is complete agreement between theory and observation regarding the short-term fluctuations. Let me emphasize that this effect was dismissed in the United Nations report as being climate noise, implying that the short-term variability could not contain any useful information. As a result of this assumption, a comparison between the fluctuations in these two complex networks was never made.

The other sun-to-climate linking involves the longer-term solar cycles with periods on the scale of decades. We find that averaging over the temperature anomalies reveals a periodic variation in the Earth's surface temperature.

A surface model similar in spirit to the energy balance models used in the United Nations report, but using the total solar irradiance measured by satellites as input, predicts a temperature variation which tracks the solar cycles, in agreement with the data. This result challenges the certainty of the United Nations reported conclusions in two ways.

First of all, there is uncertainty in the data used. We find that the relative contribution of the greenhouse gases to the temperature increase is determined by which input data set is used in the calculation.

With one data set denoted as PMOD, P-M-O-D, 30 percent of the .8 degrees can be accounted for by solar activity.

With another data set denoted as ACRIM, A-C-R-I-M, up to 69 percent of the temperature increase is accounted for by the sun. Although both data sets are used in the climate community, the predictions in the United Nations report used only PMOD and not ACRIM.

The second destabilizing factor concerns the model employed in the United Nations report. These models were designed to reproduce the Earth's average surface temperature, so there's no wonder that they can do that. However, this only establishes self-consistency, not certainty.

Consequently, the purported agreement with the data cannot be used to determine the validity of the models. This must be done by some other independent means. This is, in fact, what we attempted to do in our research, but we found that the predictions diverge from those quoted in the United Nations report.

You might say that this merely a situation where our model results contradict their model results. I would agree with that characterization. It is a scientific debate, not a political debate.

Thank you, and I will answer any questions you might have.

MS. KYZER: Great. Thank you, Dr. West.

Gregory, do you have a question?

Q Well, the question I have deals with what you were bringing up in the beginning. I'm familiar with Dr. West's work. I've read his papers that were in Geophysical Research, and I agree with his conclusions. But it seems that the Department of Defense has been kind of quiet on allowing the minority voices on global warming to come out.

It seems that they've had several conferences on the anthropogenic global warming. So I was just wondering, is this a shift to highlight more of the skepticism?

MR. WEST: Personally, I don't know anything about the Department of Defense's position. I know that my colleague and I have made presentations at American Geophysical Union conferences on global warming and he's done most of the presentations, and that has been fairly well received. But as I said, I'm not involved in any political discussions and I'm here as a scientist. And my personal position on global warming is irrelevant, and I'm not involved in any kind of policy decisionmaking.

Q Oh, very good. Thanks a lot.

MR. HOLT: Okay. And just as a DOD rep, I would also like to state that DOD has no policy on global warming either, just as the Army.

So Lindy, go ahead.

MS. KYZER: We're just all about clarifying that there is no official policy stance -- (chuckles) -- on global warming. It's a scientific debate and we're happy to engage in the scientific research portion of that.

Does John have a question?

Q Kind of, but mostly -- will the doctor's statement be part of the transcript? Simply because he went fast enough that, while I followed it, I couldn't scribe it all. And I would hate to misquote any of that.

MS. KYZER: We'll have that available. I can send you a copy. I'll make sure everyone gets a copy of that.

Q Okay. Dr. West, are you willing to take the plunge and give us your personal opinion, or are you going to keep this all on a scientific level?

MR. WEST: I'm keeping it on a scientific level.

Q Okay.

MR. WEST: I think my personal opinions are irrelevant.

MS. KYZER: Okay. Brad, do you have a question?

Q Yes, I do. Doctor, first of all, thank you for talking to us today. This us a real privilege to be able to talk to you.

My question is could you tell us in layman's terms, as far down for some of us as you can get, what were the problems with the computer models that the IPCC used in order to come to their results?

MR. WEST: Okay. Let me give you a brief synopsis of how the science of this would work, whether you're talking about global warming or any other observational science. The thing to note is that you don't have a laboratory, so you can't do a controlled experiment. What you have are observations. And now what you want to do is you want to try to understand what it is you're observing. So you take measurements over time and you get a time series, and that tells you, for example, what the average temperature of the Earth is over a period of time.

Now, the climatologists and the meteorologists understand the physics of what's going on, or at least part of the physics of what's going on, so they build up this computer model that has different mechanisms in it -- how temperatures transfer to the atmosphere, how the atmosphere flows as a fluid, how one region of the Earth is connected to another region of the Earth, and on and on, all these different mechanisms.

They try to put all of that in one model, and from that model they then have an input. And the input is the solar irradiation, the energy that's being put into the Earth from the sun. The first assumption they make is that that's a constant. All right? That's -- and that's question number one, which can underline.

So you put that input in and now you adjust these various mechanisms -- how storing they are, how weak they are, how energy is transferred and moved around on the surface of the Earth -- to try and reproduce this erratic observation that you made of what the temperature of the Earth is doing. And you do -- and people have been doing this in a serious, systematic way for 30, 40 years for these large-scale computer models, the general circulation models. So now you get -- you're now able to reproduce what the temperature on the Earth is doing, with your model.

If you were doing a laboratory experiment, what you would have, you would have one set of data on which you would adjust the parameters of your model and then you would have another set of data on which you'd make a prediction and see how good your model is.

The problem is we only have one Earth; we only have one observation of what's happening with the temperature. So we have the situation in which the model characterizes what's happening with the temperature, so you have self-consistency. Yes, the model does describe what's happening with the temperature field, but you have no independent verification of the model that you would have in laboratory experiment.

And so that was part of the reason that motivated us to go back and look at things in a somewhat different way from the way the modelers were looking at it that were all recorded in this United Nations report.

And one of the things we changed is the recognition that the total solar irradiance, the amount of energy that comes to the Earth from the sun, is not constant, but changes, and we have satellite data that tells how it changes. Using that data, we were able to show that you could reproduce both the short-scale statistical fluctuations and these longer-scaled variations associated with the solar cycles to reproduce what's in the data.

So it's -- so what it shows is that the certainty of the results, this 95 percent certainty that was quoted in the United Nations report that the solar variability had no influence is an overstatement of what they could conclude.

And the reason I brought up the 30 percent of the .8 degrees or the 69 percent of the .8 degrees is because those are the two data sets we have for the solar irradiation. And if you use one you get one result; if you use the other you get the other result. And so it becomes, well, how do they differ? And that's a scientific dialogue about data and satellites and calibration and all of that, which is continuing undergoing.

So it's not that I'm saying that the cause of the global warming is not greenhouse gases; certainly greenhouse gases contribute. It's a matter of how much and what is the balance between naturally occurring influences, which is the variability in the sun, versus man's contribution, which are these anthropogenic greenhouse gas effects.

Q Thank you very much, sir.

MR. WEST: Sure.

MS. KYZER: Great.

Christian with Military.

com, do you have a question?

Q Yes, thank you. Hi, Dr. West.

You know, you're going to have to excuse me. I'm a relatively simple guy. I understand guns and bombs and jeeps and stuff, but a lot of this kind of goes over my head. But could you do me a favor and kind of dumb it down a little bit?

Could you tell me how this research and how the other research that you do with the Army's Research Office could contribute to changes in the way the Army does what the Army does? What is the on- the-ground applicability of what you're looking into?

MR. WEST: Okay. For this, we'll have to do a little history, and that is towards the end of the Second World War, FDR, recognizing the contributions that the military research was making into civilian applications such as penicillin, that was coming out of that research, he wrote a memo to his chief scientist, who was -- in D.C. at that time -- was Vander veer Bush, who was an MIT professor on leave as part of the war effort. And he asked them how this -- could the government do something so that this military research could have civilian application and it wouldn't be lost.

And Bush wrote a now-legendary report, which is called "Science: The Endless Frontier," in which he laid out how the government could formulate agencies that were under civilian control --

Q Right.

MR. WEST: -- but would distribute the money from the military to perform this research that had civilian and -- as well as military application.

Now, that led directly to -- and that report was published, or made available, in 1948, after FDR had died -- and that led directly in the early '50s to the formulation of the Office of Naval Research, the Air Force Office of Scientific Research, the Army Research Office, and the National Science Foundation. All came out of that document, all for the same kind of purpose. All right, now fast-forward. The kind of research that's being supported by the Army Research Office is primarily basic research that's done at universities. That's what the Army Research Office does. We -- the typical program manager here reviews projects that are proposed by university professors and it's peer-reviewed in the same way -- well, in a way related to how the National Science Foundation does it, and money is let out to do research that's fundamental.

And, by definition, fundamental research is long-term. Like, no one could have predicted the implications or applications of the laser or the transistor. That was long-term research. That's what's being done at the Office of Naval Research. A few of us who are more senior are -- have the luxury of doing, for 40 percent of our job, we can do our own independent research on areas we think are important.

My own area of research has been on trying to understand how one complex system interacts with another complex system, independent of the details of that interaction -- how the information is transferred. And working on that general theory, my post-doc was interested in the global warming problem.

And I cautioned him early on that this was a politically sensitive area of investigation, and since he was relatively new, I -- in a fatherly way I tried to tell him this might not be the best area of investigation.

But he wanted to do it, so that's one of the applications we made of this more general theoretical investigation about complex networks is onto the global -- how the sun and the Earth are linked together. And that led to this -- directly to this -- how the statistical fluctuations of the -- in the Earth's temperature field inherits the statistics of the sun's dynamics.

Q Okay. So distilling that down, it really boils down to how two complex systems interact, and what factors cause what reactions, basically? And that can be applied to the military in developing various things, is that what you're saying?

MR. WEST: Yes. As a matter of fact, the system of systems concept that the military developed grew out of the -- sort of the scientific background -- where these ideas of complexity and network science were developing.

And people in the military recognized that the system of systems, that the Army is based on how they interact with one another and how they respond to each other, and that a generic understanding of that very complex, interactive network would assist the Army in just performing its mission, whether it's a humanitarian mission, whether it's a traditional war mission, whatever the mission is, that a general understanding of how these different networks interact with one another would be very useful for the Army. Q That's great. Thanks a lot.

MR. WEST: Sure.

MS. KYZER: Okay. Noah, do you have a question?

Q I do. Doctor, thanks for taking the time to do this.

And I read a bunch of your papers over the last couple of days. And a couple of things jumped out at me and I wanted you to explain a couple of them.

In a 2006 paper to Geophysical Letters, I believe --

MR. WEST: Yes.

Q -- you note that you do some modeling of temperature anomalies from 1600 to 2000, and you say that in the 20th century there is a clear surplus warming, which I'm assuming means global warming. Then you say that since 1975, global warming has occurred much faster than could reasonably be expected from the sun alone.

Can you go into that a little bit and talk about what other factors in addition to the sun might be contributing to that and why they seem to be concentrated in the 20th century in general, and since 1975 in particular?

MR. WEST: Well, this has to do directly with the possible contribution of greenhouse gases. And the reason we were cautious in the way we couched the term is because there's a -- part of this we don't understand. This is a very complex business.

And one of the things we don't understand is if you look at the -- just the average temperature, average global temperature from 1978 through 2000, it reaches a peak, it decreases slightly, flattens out, and then increases markedly again.

Now, throughout that period, the CO2 concentration has been steadily increasing. Doesn't decrease at all. If the interpretation were as simple as the temperature increase is coupled to the greenhouse gases, so as the greenhouse gases increase the temperature increases, you wouldn't have this flattening of the temperature. So there's some mechanism that's operating that we don't understand that has to do with the complex dynamical environment of the Earth.

And so when I put forward the notion that the sun is contributing, that piece I can understand and I can track and I can see the -- I can see how one is related to the other. And I know that greenhouse gases are also contributing, but the connections are much more complex, and we don't yet understand.

And I'm not saying that I personally don't understand -- which is, in fact, true -- but the scientific community does not understand how to accurately model these non-linear dynamical interactions in a global way.

Q And just a quick follow-up.

MR. WEST: Sure.

Q If greenhouse gases do contribute, although the level is unclear, as sort of Army policy would you advise the Army to invest more heavily in trying to cut down those greenhouse gases and trying to work with diesel-electrics or what have you?

MR. WEST: I've avoided making those kinds of suggestions in briefings to generals, so I'm certainly not going to make any kind of suggestion here. (Chuckles.)

As I said, I am not a policy maker. I don't understand the implications of policy. I'm not good at politics, and so I avoid it. I can give the science; I can give you what my level of certainty is of a given scientific result and explain how I obtained that result. But the political or policy implications I leave to people that specialize in that field, and I have great respect for them because I know it's a very difficult field.

So I don't presume to make policy for people or to tell people what policy they should make.

Q Okay. Let me try one more tack --

You said that the sun could contribute to up to 69 percent of global warming.

MR. WEST: Yes.

Q Do you have a sense of up to what percentage you think greenhouse gases could contribute?

MR. WEST: They -- I would say that these are the two -- they trade off. If it's not -- the other 31 percent is the greenhouse gases, and by the same token, if you use the PMOD data and you get the 30 percent contribution for the solar variability, then it's the 70 percent that are greenhouse gases. I mean, those are the two candidates.

Q Thank you very much.

MR. WEST: Sure.

MS. KYZER: To answer question B, though, I can say that the Army is actively reducing carbon emissions and its carbon footprint. And in terms of environmental endeavors, the use of hybrid technology, developing combat vehicles that utilize that technology, and trying to reduce our need for petroleum in Army vehicles, we're actually working to do that.

And if you would like a story in that regard, I can put you in touch with many Army environmentalists who would love to talk to you. So you have my e-mail address.

Q Great.

MS. KYZER: I think we heard someone beep in toward the end. Is there anyone else on the line who did not get a question? Q Yes. Hi, this is Jason Sigger with the Armchair Generalist. This is a very quick question. I apologize for missing the beginning of your discussion.

But I've seen it commented that the Navy, for instance, is using the point that there will be global warming and that will have some kind of an impact on their planning and operations. So based on what I think I heard over the last half hour, you're not disputing that global warming exists. It --

MR. WEST: Oh, no. It's very real.

Q Okay. And the Army probably should consider it in some way or form in any kind of future strategy or plans that they are undertaking?

MR. WEST: Oh, I'm -- I know that policy makers are taking this into account. And the environmental scientists that are here at the Army Research Office, at least one of the programs I know about, has invested research funds in trying to determine the certainty of these -- of the implications, policy implications of environmental changes.

Q Thanks very much.

MR. WEST: Sure.

MS. KYZER: I think that is -- everyone has had a chance for a question, so I know that Dr. West has come concluding remarks. You can go ahead and go to those, Dr. West.

MR. WEST: Okay. I hope that I have been able to make reasonable that the controversy over the causes of global warming -- whether greenhouse gases or solar variability is dominant -- is not settled.

This is not surprising to a scientist, because of the extreme complexity of the sun-climate network. I have not attempted to argue for a particular conclusion, except that the uncertainty in the data is real and must be accounted for in our models.

We are attempting to understand the complex phenomenon causing global warming and, hopefully, bring the discussion back into the scientific domain where it belongs.

We are also trying to avoid contributing to the political debate and recognize that there are fundamental uncertainties in our present understanding of the causes of global warming as acknowledged in the United Nations report. And presenting model calculations as if they were reality is misleading.

Assertions of certainty confuse the simple map with the complex reality, so let's leave the resolution of the debate in the hands of those who know the difference. Thank you.

MS. KYZER: Thank you so much, Dr. West. Thank you, everyone who participated. Again, if you have follow-up questions, just send me an e-mail.

MR. WEST: Thanks a lot.

MS. KYZER: Thank you, Jack Holt and DOD.

END.